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AUTHOR Ljungberg, Sixten
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ABSTRACT

This paper focuses on the importance of information and documentation (I&D) as one of the essential production factors in pharmaceutical industrial activities. The need for and use of I&D services depends far more on such factors as product profile, decision making processes within the organization, and ownership than on the size of the companies concerned. Precise and relevant information increases the reliability of complicated decision-making process. Units with I&D responsibilities should be properly integrated into the company's total information flow; increased integration results in increased effectiveness. Even though I&D is available and often necessary in the decision making process, it is not always put to effective use. Many barriers exist which prevent proper access to the information and its further dissemination, which results in increased problems for the potential user. Trade, industry, and society must cooperate to arrive at a more systematic communication of knowledge if the technological level is to be raised for industry in general and product development stimulated. Copies of charts and figures are appended. (Author/JPF)

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# INFORMATION AS AN IMPORTANT PRODUCTION FACTOR

SIXTEN LJUNGBERG

AB ASTRA, SÖDERTÄLJE, SWEDEN

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# INFORMATION AS AN IMPORTANT PRODUCTION FACTOR

Sixten Ljungberg
AB Astra, Södertälje, Sweden *

## INTRODUCTION

The theme of my speech today bears analogy with a well known saying attributed to the Chinese philosopher Confucius who was active about 2 500 years ago, viz (Fig 1).

"The essence of knowledge is - having it - to apply it"

## THE NEED FOR I & D

There is no doubt, even today, that knowledge - often expressed as Information or Information and Documentation (I & D) - is an important factor in industrial production. However, I think all of us must agree that there are other, equally essential factors. For example: (Fig 2)

- Capital
- Raw materials
- Manpower

All are necessary in the running of an efficient industrial concern but today I should like to focus attention on the Information aspect (or I & D, which is the term I will use more or less consistently in the following).

The need for I & D varies greatly from company to company. It is important to realize too that the normal classification of companies according to their size - in other words based on the number of employees or annual turnover - can give a misleading picture in terms of evaluating I & D requirements. Instead, I would claim that an industry's need for - and its use of - I & D services depends far more on such factors as product profile, decision-making processes and ownership than on the size of the companies concerned.

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Contribution to the conference on "Informatics and Communication as Energy Resources" at the Stockholm University, Sweden on May 22 - 23, 1978.

I can briefly illustrate this statement by showing the following slide (Fig 3). It describes the I & D need by six industrial companies, differing in size between less than 100 to >1 000 employees, each with different marketing and manufacturing activities and with decision-making processes of varying degrees of difficulty. The profile is also different for each, ranging from simple standard products to technologically highly advanced products (1).

The slide shows amongst other things that small and medium-sized companies (no.'s 5 and 4) with advanced marketing and R & D activities (indicated by more complex decision-making processes and a "higher" profile) have a greater need of I & D than very large manufacturing companies (no. 3) with a broad line of standard products.

## PRODUCT DEVELOPMENT - TECHNOLOGICAL INNOVATION

Product renewal or product development is an important field of a company's operations. Product development covers a number of activities ranging from simple improvements up to highly sophisticated technological innovations.

The technological innovation process has been defined as the "technical, industrial and commercial steps which lead to the marketing of new manufactured products and to the commercial use of new technical processes and equipment." Innovation is a logically sequential - though not necessarily continuous - process, which can be subdivided into a series of functionally separate, but interacting and independent stages (Fig 4). The overall pattern of the innovation process can be thought of as a complex net of communication paths linking the various stages of the process (2).

It would appear to be extremely important therefore, to the successful conclusion of technological innovation, that efficient communications are established and maintained - both intra- and extra organisationally - throughout the course of the innovation. The innovation process has a high impact on the need of I & D and on the development of information systems.

It is known that the incoming I & D in many technically progressive firms is generally of a very high quality. Such companies are also known to have effective I & D systems, e.g. for internally generated information and the people involved are willing to share this knowledge. This is a special characteristic of companies with an intensive research commitment, such as those in the pharmaceutical industry, where the need for information and the awareness of this need are very great (3). Much information is generated in the research process in the form of R & D reports, minutes, experimental data etc (Fig 5).

The flow of externally generated information is carefully handled through well established systems for acquisition, selection and dissemination as shown on the next slide (Fig 6).

It is also essential to underline here the importance of the social changes and their impact on the technological innovation process. In the future (Fig 7) industrial firms will have to base their innovative effort not only on the technological feasibility and the economic profitability of a project but also on its social acceptability (4). This means that social requirements must be taken much more into account when planning new products. Consequently all producers will have to follow the current state and the future development of society's aims and needs (socio-economy) as thoroughly as the new trends within science and technology.

## THE DECISION-MAKING PROCESS

Knowledge (from education and experience), and I & D (the identified and evaluated knowledge relevant to a specific requirement) are the basis of good decision-making (Fig 8). On the basis of the knowledge and the I & D available the expectation is that the innovation or the change will bring about optimum benefits. This,however, is most uncertain since these benefits will only accrue or be produced in the future. We live in a complex and changing world in which knowledge can rapidly become obsolete. New knowledge and relevant information is required to supplement the old and will increase the reliability of the decision-making process. We must also keep in mind that precise and relevant information is a legitimate claim

by the authorities in the marketing of products and a legal part of product liability.

To speed up the decision-making process the scientist or the constructor also need I & D, for example, to avoid duplication of work, to find inspiration and get ideas about new methods.

The decision-making process is complicated and it is important to point out that units which are responsible for I & D activities are properly fitted into the company's total information flow. Increased integration will result in increased effectivity.

## BARRIERS TO INFORMATION ACCESS

I think most people will accept the conclusion that access to precise and reliable information - scientific, technological, commercial and managerial - at the right time, to the right person in a form most conveniently usable by him, can help to minimize the wastage of resources due to unnecessary and unintended reinvention, rediscovery, redevelopment, and above all the making of unfruitful decisions which result in wasted resources. A decision is generally no better than the information to which the decision-maker has access. (Fig 9). The availability of the right type of information can stimulate new directions in research, development, and managerial action.

We know from some investigations and from estimations made by the Swedish Association for Metal Transforming (Svenska Mekanförbundet) that as much as 95% of all R & D is already made - and also published somewhere.

How can we then explain that I & D, which is such a valuable and available resource, is not used effectively enough?

This is really a paradox and we must admit that there are a lot of barriers to the communication of knowledge. This problem is as serious as the lack of knowledge. We have indeed no automatic process through which knowledge/I & D will be transferred to and used in industry or in the whole of society. Any barriers to the access of information will prevent proper communication and information flow, causing problems to the user.

The barriers to the access of I & D are numerous (Fig 10) and I will only shortly mention some of them as we have no time to discuss them in detail, viz. prejudices, ignorance, languages, over-production, pollution (noise), jargon, time, economics, culture.

Some of the information barrier problems have been identified and thoroughly analysed by amongst others, Pauline Atherton, Syracuse, U.S.A. (5). Some of the just mentioned problems are extracted from one of her publications.

## JOINT EFFORTS

The challenge of overcoming or minimizing such barriers lies within the scope of the true information professional. That is right per se.

In order to increase the technological level in industry in general and to stimulate product development - which will make companies more competitive, especially on the international market - trade, industry and society have to cooperate more than is the case today to arrive at a more systematic communication of knowledge, i.e. an optimum information transfer in industry. One way to realize this goal is to train all intermediaries between the producer and the user in the requirements, techniques and use of information transfer systems - in other words make clear to all the parties involved the importance of a properly functioning scientific, technical and commercial, information supply.

Other interesting proposals to implement information transfer have been presented in the newly published report submitted by the Swedish Government Commissions, viz. "Scientific and Technical Information Provision in Sweden" (6).

I will end my speech by saying that I & D is a tremendous commodity and a national resource which must be used much more effectively than it is today.

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78-06-05
S Ljungberg/IR

# INFORMATION AS AN IMPORTANT PRODUCTION FACTOR

- INTRODUCTION
- THE NEED FOR I & D
- PRODUCT DEVELOPMENT - TECHNOLOGICAL INNOVATION
- THE DECISION-MAKING PROCESS
- BARRIERS TO ACCESS TO INFORMATION
- JOINT EFFORTS

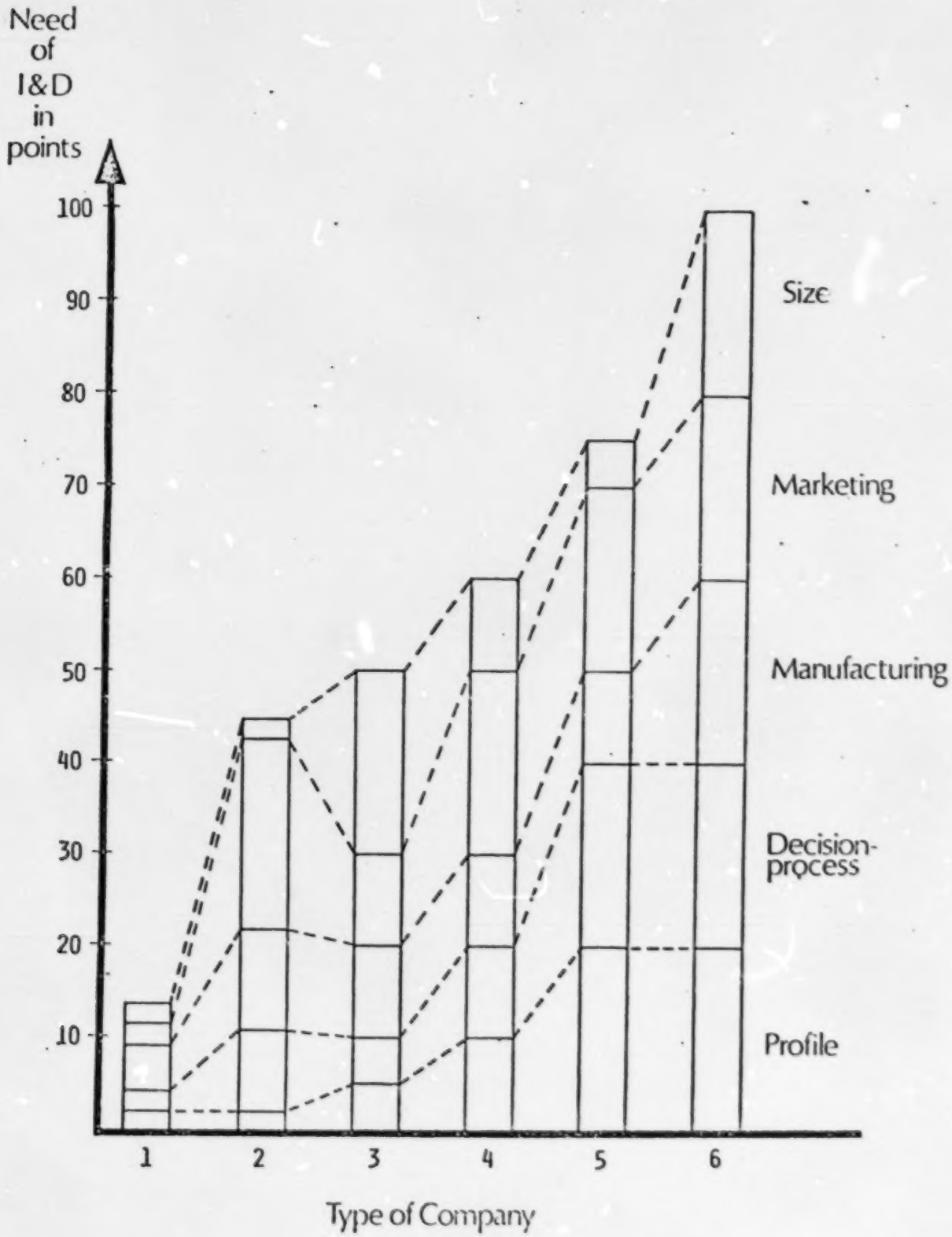
THE ESSENCE OF KNOWLEDGE IS - HAVING IT -

TO APPLY IT

(CONFUCIUS, CHINESE PHILOSOPHER ABOUT 500 B.C.)

# PRODUCTION FACTORS:

- Capital
- Raw Materials
- Manpower
- I & D


Need of I&D in points
100
90
80
70
60
50
40
30
20
10
1
2
3
4
5
6
Type of Company
Size
Marketing
Manufacturing
Decision-process
Profile

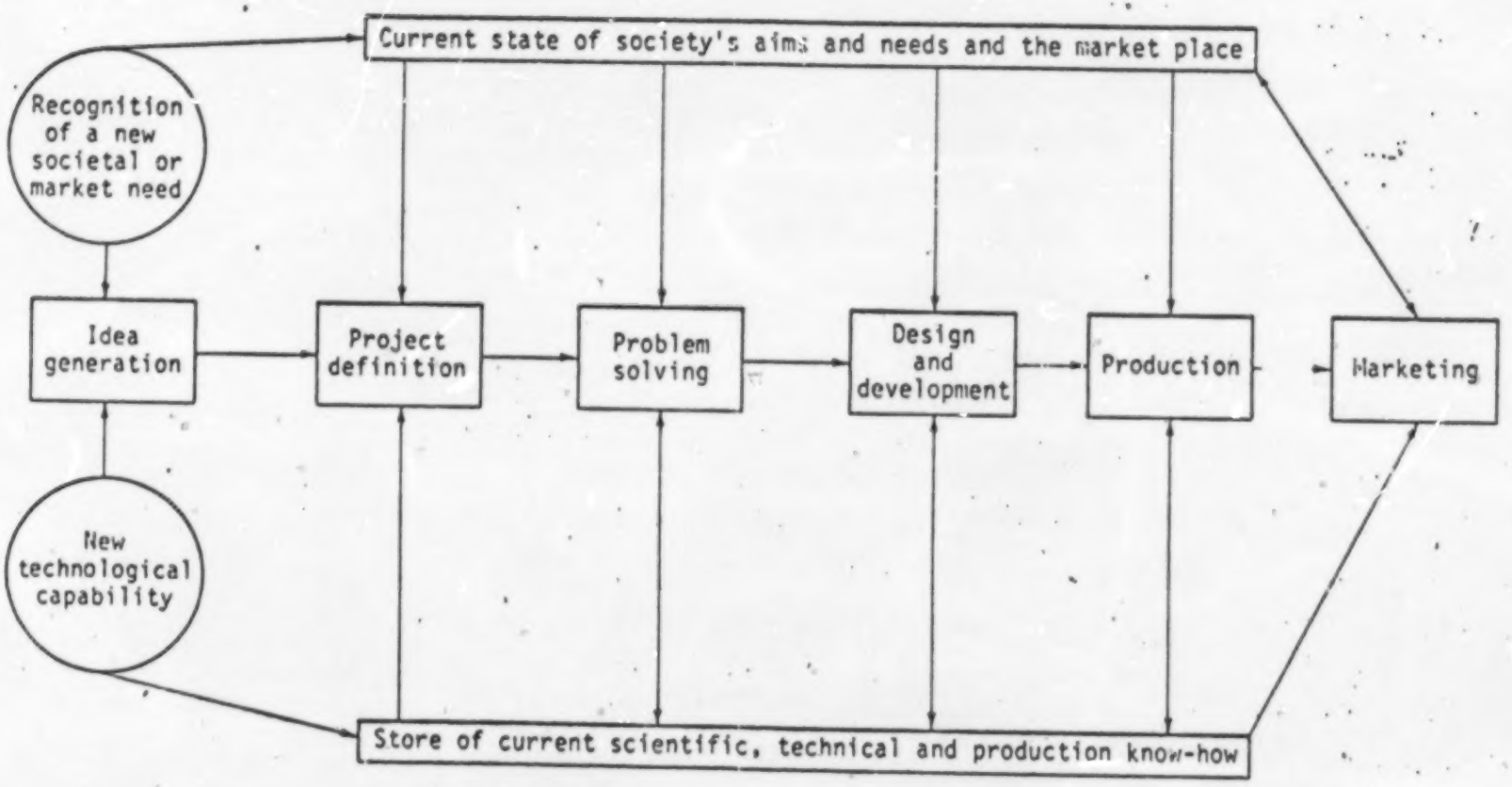

Current state of society's aims and needs and the market place
Recognition of a new societal or market need
Idea generation
Project definition
Problem solving
Design and development
Production
Marketing
New technological capability
Store of current scientific, technical and production know-how

Fig. 1. Model for the innovation process.

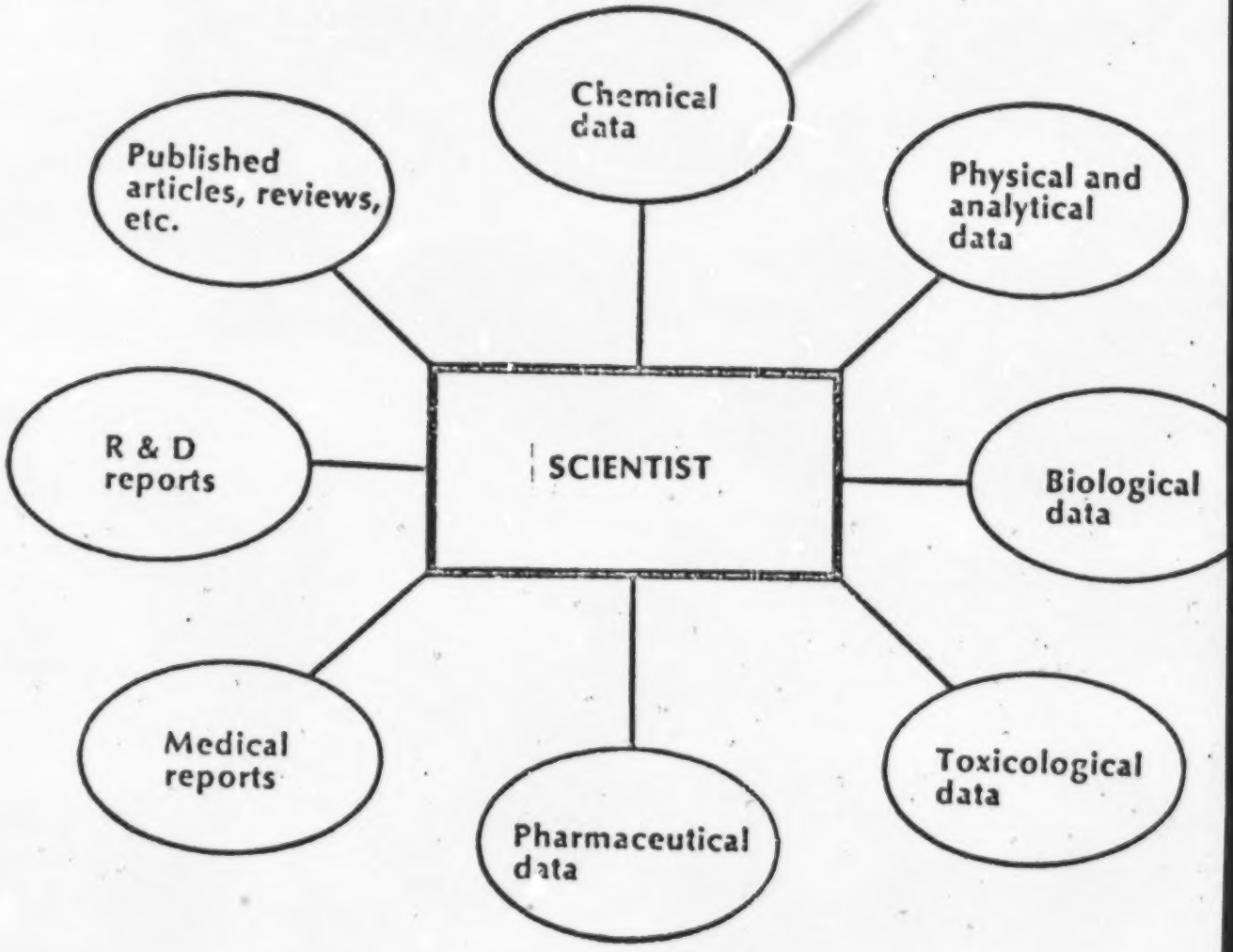
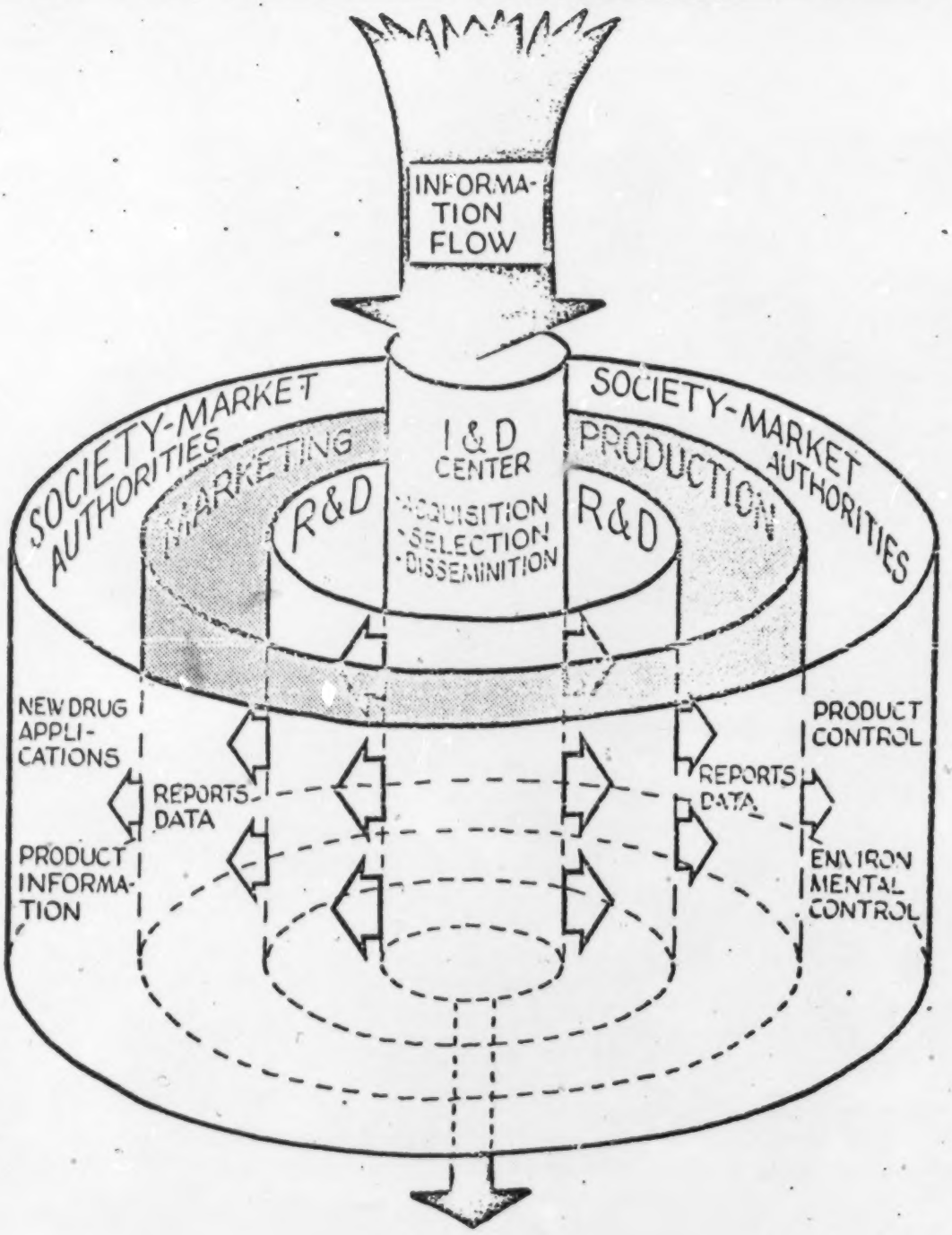



FIG. 5

Information generated by the scientist in the research process




**The information flow within a research intensive company**

## CRITERIA FOR FUTURE INDUSTRIAL PRODUCTS:

- TECHNOLOGICAL FEASIBILITY
- ECONOMIC PROFITABILITY
- SOCIAL ACCEPTABILITY

BASIS FOR GOOD DECISION - MAKING:

- KNOWLEDGE (FROM EDUCATION AND EXPERIENCE)

- I & D ( THE IDENTIFIED AND EVALUATED KNOWLEDGE, RELEVANT TO A SPECIFIC REQUIREMENT)

A DECISION IS GENERALLY NO BETTER THAN THE

INFORMATION TO WHICH THE DECISION - MAKER

HAS ACCESS

BARRIERS TO THE ACCESS OF INFORMATION:

- PREJUDICES
- IGNORANCE
- LANGUAGES
- OVER-PRODUCTION
- POLLUTION (NOISE)
- JARGON
- TIME
- ECONOMICS
- CULTURE